

IN THE CLAIMS

Please amend the claims as follows:

Claims 1-17 (Canceled).

Claim 18 (Currently Amended): A radio communication apparatus at a transmission side that includes a plurality of transmission antennas and performs a communication using at least one carrier, the radio communication apparatus comprising:

a channel dividing unit configured to divide~~that divides~~ a transmission signal into a plurality of channels based on channel structure information returned from another radio communication apparatus at a reception side and indicating a structure of a space-division-multiplexing method of structuring a multiple-input-multiple-output channel and a space-time-coding channel between transmission and reception antennas~~informed from a communication apparatus at a reception side~~; and

a space-time-coding unit configured to realize~~that realizes~~ transmission diversity by performing a space-time-coding processing for each of the plurality of channels~~divided~~.

Claim 19 (Currently Amended): The radio communication apparatus according to claim 18, further comprising:

a beam forming unit configured to perform~~that performs~~ an individual direction control by a complex multiplication with respect to each of the plurality of channels to which the space-time-coding processing is performed, and to distributedistributes the plurality of channels ~~to for each of the~~ plurality of transmission antennas; and

an adding unit configured to add~~that adds~~ all of the transmission signals to which the direction control is performed corresponding to each of the plurality of transmission antennas.

Claim 20 (Currently Amended): A radio communication apparatus at a reception side that includes at least one reception antenna and performs a communication using at least one carrier, the radio communication apparatus comprising:

a channel estimating unit configured to estimate~~that estimates~~ a channel gain between a transmission side and the reception side; and

a channel-structure determining unit configured to determine~~that determines~~ a structure of a multiple-input-multiple-output channel based on a result of the estimation of the channel gain, a physical configuration of an other radio communication apparatus at the transmission side, and a physical configuration of the radio communication apparatus, and to return~~informs~~ channel structure information indicating a structure of a space-division-multiplexing channel and a space-time-coding channel between transmission and reception antennas that is a result of the determination to the other radio communication apparatus at the transmission side.

Claim 21 (Currently Amended): The radio communication apparatus according to claim 20, wherein the channel-structure determining unit is further configured to generate~~generates~~ the channel structure information based on at least one of the result of the estimation of the channel gain, a number of antennas of the other radio communication apparatus at the transmission side and of the radio communication apparatus, and a

computational capability of the other radio communication apparatus at the transmission side and of the radio communication apparatus.

Claim 22 (Currently Amended): The radio communication apparatus according to claim 21, further comprising a coherent bandwidth~~coherent band-width~~ measuring unit configured to measure~~that measures~~ a coherent bandwidth at a channel by observing a reception signal, wherein

the channel estimating unit is further configured to divide~~divides~~ a signal band into a plurality of subcarrier groups having the same channel information based on a result of measurement of the coherent bandwidth, and to perform~~performs~~ the estimation of the channel gain per~~in units of~~ a subcarrier group.

Claim 23 (Currently Amended): The radio communication apparatus according to claim 22, wherein the channel estimating unit is further configured to perform~~performs~~ the estimation of the channel gain for a plurality of subcarriers within ~~the~~each subcarrier group, and to average~~averages~~ results of the estimation of the channel gain for the plurality of subcarriers.

Claim 24 (Currently Amended): A radio communication apparatus that includes a plurality of transmission antennas and at least one reception antenna, and performs a communication using at least one carrier, the radio communication apparatus comprising:  
a transmission-processing unit including~~comprising~~:

a channel dividing unit configured to divide~~that divides~~ a transmission signal into a plurality of channels based on channel structure information returned from a first radio communication apparatus at a reception side and indicating a structure of a space-division-multiplexing method of structuring a multiple-input-multiple-output channel informed~~and a space-time-coding channel between transmission and reception antennas from a communication apparatus at a reception side;~~, and  
a space-time-coding unit configured to realize~~that realizes~~ transmission diversity by performing a space-time-coding processing for each of the plurality of channels-divided; and  
a reception-processing unit including~~comprising~~:

a channel estimating unit configured to estimate~~that estimates~~ a channel gain between a transmission side and a reception side~~[[;]]~~, and

a channel-structure determining unit configured to determine~~that determines~~ a structure of a multiple-input-multiple-output channel based on a result of the estimation of the channel gain, a physical configuration of a second radio communication apparatus at the transmission side, and a physical configuration of the first radio~~[[a]]~~ communication apparatus at the reception side, and to return~~informs~~ channel structure information that is a result of the determination to the second radio communication apparatus at the transmission side.

Claim 25 (Currently Amended): The radio communication apparatus according to claim 24, wherein the channel-structure determining unit is further configured to generate~~generates~~ the channel structure information based on at least one of the result of the

estimation of the channel gain, a number of antennas of the second radio communication apparatus at the transmission side and of the first radio communication apparatus at the reception side, and a computational capability of the second radio communication apparatus at the transmission side and the first radio communication apparatus at the reception side.

Claim 26 (Currently Amended): The radio communication apparatus according to claim 25, wherein

the reception-processing unit further includes a coherent bandwidth~~coherent band width~~ measuring unit configured to measure~~that measures~~ a coherent bandwidth at a channel by observing a reception signal, wherein

the channel estimating unit is further configured to divide~~divides~~ a signal band into a plurality of subcarrier groups having the same channel information based on a result of measurement of the coherent bandwidth, and to perform~~performs~~ the estimation of the channel gain per~~in units of~~ a subcarrier group.

Claim 27 (Currently Amended): The radio communication apparatus according to claim 26, wherein the channel estimating unit is further configured to perform~~performs~~ the estimation of the channel gain for a plurality of subcarriers within each~~the~~ subcarrier group, and to average~~averages~~ results of the estimation of the channel gain for the plurality of subcarriers.

Claim 28 (Currently Amended): A transmitter that includes a plurality of transmission antennas and transmits a transmission signal to a receiver using at least one carrier, the transmitter comprising:

a channel dividing unit configured to divide~~that divides~~ a transmission signal into a plurality of channels based on channel structure information returned from the receiver and indicating a structure of a space-division-multiplexing method of structuring a multiple-input-multiple-output channel informed~~and a space-time-coding channel between transmission and reception antennas from the receiver~~; and

a space-time-coding unit configured to realize~~that realizes~~ transmission diversity by performing a space-time-coding processing for each of the plurality of channels~~divided~~.

Claim 29 (Currently Amended): The transmitter according to claim 28, further comprising:

a beam forming unit configured to perform~~that performs~~ an individual direction control by a complex multiplication with respect to each of the plurality of channels to which the space-time-coding processing is performed, and to distributedistributes the plurality of channels ~~to for each of the~~ plurality of transmission antennas; and

an adding unit configured to add~~that adds~~ all of the transmission signals to which the direction control is performed corresponding to each of the plurality of transmission antennas.

Claim 30 (Currently Amended): A receiver that includes at least one reception antenna and receives a signal from a transmitter using at least one carrier, the receiver comprising:

a channel estimating unit configured to estimate~~that estimates~~ a channel gain between a transmission side and a reception side; and

a channel-structure determining unit configured to determine~~that determines~~ a structure of a multiple-input-multiple-output channel based on a result of the estimation of the channel gain, a physical configuration of the transmitter, and a physical configuration of the receiver, and to return~~informs~~ channel structure information indicating a structure of a space-division-multiplexing channel and a space-time-coding channel between transmission and reception antennas that is a result of the determination to the transmitter.

Claim 31 (Currently Amended): The receiver according to claim 30, wherein the channel-structure determining unit is further configured to generate~~generates~~ the channel structure information based on at least one of the result of the estimation of the channel gain, a number of antennas of the transmitter and of the receiver, and a computational capability of the transmitter and of the receiver.

Claim 32 (Currently Amended): The receiver according to claim 31, further comprising a coherent bandwidth~~coherent band-width~~ measuring unit configured to measure~~that measures~~ a coherent bandwidth at a channel by observing a reception signal, wherein

the channel estimating unit is further configured to divide~~divides~~ a signal band into a plurality of subcarrier groups having the same channel information based on a result of measurement of the coherent bandwidth, and to perform~~performs~~ the estimation of the channel gain per~~in units of~~ a subcarrier group.

Claim 33 (Currently Amended): The receiver according to claim 32, wherein the channel estimating unit is further configured to perform~~performs~~ the estimation of the channel gain for a plurality of subcarriers within each~~the~~ subcarrier group, and to average~~averages~~ results of the estimation of the channel gain for the plurality of subcarriers.

Claim 34 (Currently Amended): A radio communication system comprising:  
a transmitter configured to transmit~~that transmits~~ a transmission signal to a receiver using at least one carrier, the transmitter including~~comprising~~:

a plurality of transmission antennas~~[[;]]~~,

a channel dividing unit configured to divide~~that divides~~ a transmission signal into a plurality of channels based on channel structure information returned from the receiver and indicating a structure of a space-division-multiplexing method of structuring a multiple-input-multiple-output channel informed and a space-time-coding channel between transmission and reception antennas~~from the receiver~~, and

a space-time-coding unit configured to realize~~that realizes~~ transmission diversity by performing a space-time-coding processing for each of the plurality of channels~~divided~~; and



a receiver configured to receive~~that receives~~ the transmission signal from the transmitter using at least one carrier, including~~comprising~~:

at least one reception antenna~~[[;]]~~,

a channel estimating unit configured to estimate~~that estimates~~ a channel gain between a transmission side and a reception side~~[[;]]~~, and

a channel-structure determining unit configured to determine~~that determines~~ a structure of a multiple-input-multiple-output channel based on a result of the estimation of the channel gain, a physical configuration of the transmitter, and a physical configuration of the receiver, and to return~~informs~~ channel structure information that is a result of the determination to the transmitter.

Claim 35 (Currently Amended): The radio communication system according to claim 34, wherein the channel-structure determining unit is further configured to generate~~generates~~ the channel structure information based on at least one of the result of the estimation of the channel gain, a number of antennas of the transmitter and of the receiver, and a computational capability of the transmitter and of the receiver.

Claim 36 (Currently Amended): The radio communication system according to claim 35, wherein

the receiver further includes a coherent bandwidth~~coherent band-width~~ measuring unit configured to measure~~that measures~~ a coherent bandwidth at a channel by observing a reception signal, wherein

the channel estimating unit ~~is further configured to divide~~ divides a signal band into a plurality of subcarrier groups having the same channel information based on a result of measurement of the coherent bandwidth, and ~~to perform~~ performs the estimation of the channel gain ~~per in units of a~~ subcarrier group.

Claim 37 (Currently Amended): The radio communication system according to claim 36, wherein the channel estimating unit ~~is futher configured to perform~~ performs the estimation of the channel gain for a plurality of subcarriers within ~~the each~~ subcarrier group, and ~~to average~~ averages results of the estimation of the channel gain for the plurality of subcarriers.

Claim 38 (New): The radio communication apparatus according to claim 18, wherein the radio communication apparatus is configured to simultaneously use the space-division-multiplexing channel and the space-time-coding channel in the communication.

Claim 39 (New): The radio communication apparatus according to claim 24, wherein the transmission-processing unit is configured to simultaneously use the space-division-multiplexing channel and the space-time-coding channel in the communication.

Claim 40 (New): The transmitter according to claim 28, wherein the transmitter is configured to simultaneously use the space-division-multiplexing channel and the space-time-coding channel.

Claim 41 (New): The radio communication system of claim 34, wherein the transmitter is further configured to simultaneously use the space-division-multiplexing channel and the space-time-coding channel.